

Chest Surgery in Female to Male Transgender Individuals

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Background: Societal awareness of transgender individuals has led to increased acceptance and demand for sex-confirming surgery. In female to male transsexuals, the most common procedure is removal of breast tissue to masculinize the chest.

Methods: Eighty-eight transgender patients underwent either a subcutaneous nipple-sparing mastectomy (NSM) with or without a periareolar mastopexy or nipple reduction, or bilateral mastectomies with free nipple grafts (MFNG) with or without nipple reduction. Surgical techniques are discussed. Demographic data, use of testosterone, specimen weights, rates of wound dehiscence, infection, hematoma, hypertrophic scars, nipple loss, and revision surgery were all assessed.

Results: Of the 88 patients in the study, 40 underwent NSM and 48 underwent MFNG. Patients undergoing NSM were 4.1 times more likely to have a hematoma compared with patients undergoing MFNG ($P < 0.05$). Mastectomy weight was not correlated with the occurrence of hematoma ($P > 0.80$). Only 1 patient who underwent NSM required revision, whereas 5 patients in the MFNG patient population underwent revision. Patients were more likely to have hypertrophic scarring with the MFNG technique (0% vs 25%, $P < 0.01$). There were no infections, no wound dehiscence, and no nipple loss in any patient. Eighty-three percent of the patients who responded to a satisfaction survey (57/88) were very satisfied with their result, and 100% would recommend this procedure to other transgender individuals.

Conclusions: Female to male transgender mastectomy can be performed with low complication rates and high satisfaction. Nipple-sparing mastectomy were more likely to have a hematoma than patients undergoing MFNG.

Key Words: transgender, top surgery, transsexual, breast

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Awareness of transgender individuals in the wider society has led to increased acceptance and demand for surgical services. In female to male transsexuals, the most common procedure is removal of breast tissue to masculinize the chest.¹

Estimates of the number of female to male transsexuals have increased steadily. In 1968, Pauly² estimated that the prevalence of female to male transgender individuals was at minimum 1:100,000. The incidence of transgender female to male individuals has since been estimated to be from 1:30,400 to as high as 1:8300.³ Surveys through various departments of public health suggest that 0.1% to 0.5% of the population has taken steps to transition from 1 gender to another.^{4,5} With increased acceptance of transgender individuals, there has been an increased awareness of the medical needs of this population. The 2 major sex reassignment surgeries are subcutaneous mastectomy and genital reconstruction. The first and most common procedure requested is surgery to masculinize the chest.¹

Commonly referred to as “top surgery,” masculinization requires removal of breast tissue. Although the procedures are similar to traditional gynecomastia techniques, they differ in the extent of breast excision. Transgender patients have more extensive breast development with a well-defined axillary tail of Spence. A wider dissection is

necessary to remove all glandular tissue. The goal is to eliminate residual hormonal effects on the breast and to obviate the need for breast screening.

However, the surgery involves more than a simple mastectomy as described for the treatment of breast cancer. The aesthetic requirements to achieve an acceptable male appearance have been described by Hage and van Kesteren⁶ and include chest wall contouring, reduction, and proper positioning of the nipple areolar complex (NAC), and minimizing scars. Multiple authors have reviewed the spectrum of procedures from subcutaneous mastectomy to mastectomies with free nipple grafts. Monstrey et al⁷ described an algorithm that based surgical decision-making on breast size, degree of ptosis, and skin elasticity with a progressively aggressive skin resection and subsequent increase in visible scarring as each parameter became less ideal.

The principles elucidated by these and other authors remain valid. However, with the advent of social media, we have found that patients present to the office well informed, often having watched the surgery online and discussed the experience in a community of individuals who have taken steps to transition their sex. Such patients expect to have an increased role in the decision-making process and often present with requests for specific surgical procedures. In this article, we present our 6-year experience with female to male chest surgery and describe our process for surgical decision making.

METHODS

From December of 2008 to March of 2014, 88 transgender female to male patients underwent surgery to masculinize their chest. Patient intake was via consultation with review of medical records and psychological history. The World Professional Association for Transgender Health Standards of Care, were used to screen patients regarding suitability for surgery.⁸ World Professional Association for Transgender Health Standards of Care require that the patient display persistent, well-documented sex dysphoria and live in their new sex role at all times and all settings for 1 year. Patients must also show the capacity to make a fully informed decision. If significant medical or mental health concerns are present, they must be reasonably well controlled. A letter from a licensed therapist is also required. Based on physical examination and discussion with the patient, 2 basic procedures were performed, either a subcutaneous nipple sparing mastectomy with or without a periareolar mastopexy and nipple reduction, or bilateral mastectomies with free nipple grafts with or without nipple reduction.

Follow-up occurred at 1 week, 3 weeks, 3 months, and 1 year. In cases where the patients lived a considerable distance from Boston, long-term follow-up was conducted by email communication. Patients were contacted for satisfaction surveys by email, telephone, and direct mail. The questionnaire is depicted in Figure 1. Statistical analyses of results were performed with *t* tests and Fisher exact tests.

Operative Techniques

All surgeries were performed under general anesthesia on an outpatient basis. Patients were instructed to shower with a chlorhexidine topical solution for 2 days before surgery.

Nipple-sparing mastectomy (NSM) was performed through a semicircular infra-areolar approach. Dissection was carried out using the electrocautery on cutting mode as well as sharp dissection. Care was taken to leave all subcutaneous tissue intact on the skin flaps to minimize contour irregularities. At the margin of the breast

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Please respond to the following questions:

1A. Over all how satisfied are you with the surgery?

- Very Satisfied
- Satisfied
- Unsatisfied
- Very Unsatisfied

1B. If not "very satisfied" what bother you about the result? For example:

- Scarring
- mobility/function
- symmetry
- nipple/areolar appearance/size/location
- redundant tissue/"dog ears"/contour

2A. Do you feel comfortable taking off your shirt in front of others (family, friends, partner or strangers)?

2B. If you answered "no" to question 2A, if this because of a personal reason(s) or due to the outcome of the procedure?

3A. Would you recommend this procedure to other transgender individuals who are considering top surgery?

3B. If you answered "no" to question 3A, could you please explain why?

We thank you for taking the time to participate in this survey.

Sincerely,
Dr. Richard Bartlett & Dr. Michael Frederick

FIGURE 1. Patient satisfaction survey instrument.

contour, the dissection was continued under the breast with effort being made to avoid violating the pectoralis fascia. Occasionally, the specimen had to be delivered in segments due to the limited aperture of the infra-areolar incision. After hemostasis was obtained, the incision was closed in layers using 5-0 poligecaprone 25, an absorbable monofilament suture. In cases where an areolar reduction was indicated, a new areola dimension of 25 mm was marked and the periphery was deepithelialized in a very superficial plane before the mastectomy. In cases where the discrepancy between the outer and inner circumferences was 2 cm or greater, placement of a deep dermal Benelli-type suture of 3-0 polyester was considered. Nipple reduction was by central resection and creation of 4 triangular flaps and was also done before the mastectomy. Round Jackson Pratt drains, no. 10 or no. 15, were placed before closure.

Mastectomies and free nipple grafts (MFNG) were begun by marking the patient in the preoperative waiting area to optimize scar and nipple placement. After initiation of anesthesia, the areolas were marked at a 22-mm diameter. If the nipples had significant projection, a nipple reduction was performed, and the areolas were harvested and stored in saline. Elliptical incisions were made around the base of each breast and simple mastectomies were carried out. The resulting scar was intended to lie at the caudal border of the pectoralis muscle, not necessarily the inframammary fold (IMF). Undermining was carried below the IMF, and the fascia was released if necessary to obliterate the IMF. Uniform skin flap thickness was maintained and minimal subcutaneous fat was excised. Number 15 Jackson Pratt drains were placed through lateral stab incisions. After closure of the mastectomy sites, the new areola locations were chosen with the patient in a sitting position and were de-epithelialized. The areolas were thinned manually and inset using half buried horizontal mattress sutures of 4-0 and 5-0 plain gut. Tie-over bolsters were constructed from Xeroform, cotton, and mineral oil.

For both NSM and MFNG, Marcaine 0.25% was infiltrated diffusely before wound closure. A compression garment was left on for at least 1 week. Drains and bolsters were usually removed at the 1-week postoperative visit. Patients were instructed to take off at least 1 week from work and exercise was prohibited for 6 weeks postoperatively. The MFNG graft patients or anyone with a history of hypertrophic

scarring were instructed to use silicone sheeting for 12 hours a day beginning at postoperative week 6.

RESULTS

The median age of the 88 patients in the study was 24 years, with a range of 15 to 71 years. The median BMI was 22.3, with a range of 18.6 to 41.3. Exogenous testosterone was used by a majority of the patients preoperatively (65/88 = 74%). Four patients had previously undergone a breast reduction, and 2 had undergone a hysterectomy.

A majority of the cohort underwent MFNG (48/88 = 54.5%) and the remaining underwent NSM (Table 1). The median total breast tissue excised per patient was 493.5 g (Table 1).

There were 8 short-term (<30 days) complications, all of which were hematomas. There were no surgical site infections, wound dehiscence, or loss of the NAC. Patients undergoing NSM were 4.1 times more likely to have a hematoma compared with patients undergoing MFNG ($P < 0.05$). All instances of hematoma occurred in patients on testosterone therapy. The coincidence of hematoma formation and testosterone use was statistically significant ($P < 0.05$). Mastectomy weight was not correlated with hematoma formation ($P > 0.80$).

There were 21 long-term complications, including 9 dog ears and 12 hypertrophic scars (Table 2). Although the majority of dog ears occurred in the MFNG group, statistical significance was not demonstrated in comparison to the NSM group ($P > 0.05$). All 12 of the patients who developed hypertrophic scars underwent MFNG. The coincidence of hypertrophic scar formation and MFNG was statistically significant ($P < 0.05$). The development of a long-term complication does not appear to affect overall patient satisfaction (Table 2).

There were 7 revision procedures performed in 6 patients (6.8% of 88 patients). Two patients underwent hypertrophic scar removal, 3 patients had a dog ear revision, and 1 patient received both a dog ear revision and a nipple reduction.

Patient satisfaction was assessed in 57 patients (64.8% of 88 patients) (Table 3). The remaining 31 patients could not be reached via email, telephone, or direct mail for completion of the survey. A majority of survey respondents were "very satisfied" with the results of their surgery (47/57 = 82.5%). An additional 9 respondents (15.8%) were "satisfied" and 1 patient (1.8%) was "very unsatisfied" with the results of their surgeries. The 5 qualitative responses for overall satisfaction with the results of surgery were converted to a quantitative scale from 1 to 5, with 1 representing "very dissatisfied" and 5 representing "very satisfied." Using this quantitative scale, the mean satisfaction of the entire cohort was 4.77 (Table 3). The mean satisfaction for the NSM group was 4.76, and satisfaction in the MFNG group was slightly

TABLE 1. Frequency of Surgical Procedures and Excision Weight

		Patients	Median Excision g (Range)
NSM	Only	10	303.5 (210–507)*
	NR	5	247 (98–319)
	AR	10	287 (202.5–460)†
	AR + NR	15	219 (130–480)*
		40 (45.5%)	266 (98–507)
MFNG	Only	47	1007.5 (362–2760)
	NR	1	1118
		48 (54.5%)	1055 (362–2760)
	Σ	88	493.5 (98–2760)

*Weight not recorded for 2 patients.

†Weight not recorded for 1 patient.

AR, areolar reduction; NR, nipple reduction.

TABLE 2. Frequency of Complications and Resulting Satisfaction Scores

Complication	Frequency	Original Procedure	Management	Satisfaction Score Average
Short-term				
Hematoma	8	NSM only = 2 NSM + NR = 1 NSM + AR = 2 NSM + AR + NR = 1 MFNG only = 2	8, surgical evacuation	5
Infection	0			
Dehiscence	0			
NAC loss	0			
Long-term				
Axillary dog ear	9 (10.2%)	MFNG only = 7 NSM + AR = 1	3, surgical excision	4.75
Hypertrophic scar	12 (13.6%)	MFNG only = 12	1, surgical scar revision	4.78

higher at 4.78, but this difference was not found to be statistically significant ($P > 0.05$). Of the patients reporting that they were “satisfied,” concerns were nipple appearance (2), scar (2), and contour irregularities (3). For the 1 patient who reported he was “very unsatisfied,” concerns included scar and contour irregularities.

Most patients (48/57 = 84.2%) indicated that they feel comfortable taking their shirt off in front others, which included some combination of a partner, family, friend, or strangers. All survey respondents would recommend a mastectomy procedure to other transgender individuals.

DISCUSSION

Selecting the appropriate surgical technique is the most important factor in optimizing aesthetic results and minimizing the need for significant secondary surgery. The difference in specimen weight between the 2 techniques (Table 1) reflects the fact that much larger breasts are being removed in the MFNG group. There are a range of weights that overlap in the 2 groups, indicating that factors other than size are taken into account when deciding on procedure. In general, smaller breasts with elastic skin are amenable to a periareolar approach (Fig. 2), and larger breasts require a mastectomy with a free nipple graft (Fig. 3). There is however a group of patients who do not have large breasts but exhibit grade 1 or grade 2 ptosis or have significant skin laxity (Fig. 4). Many of these individuals present requesting NSM because of the relatively short and inconspicuous scar. Such individuals are not ideal candidates for a procedure that relies on significant skin contracture but may wish to proceed anyway. These patients should be counseled regarding the risk of inadequate skin contracture and the possibility of significant contour irregularities. They should be informed that significant secondary surgery with increased scarring, added expense, and a new recovery period may be necessary.

Ptotic breasts with redundant inelastic skin require a mastectomy and a free nipple graft. Although the technique results in a much more conspicuous scar, careful positioning of the scar and the nipple areola complex can improve the result. Techniques have been described using scars that extend tangentially from the NAC.⁷ We feel that a scar across the center of the breast is unaesthetic. Scars which lie increases are less noticeable and for that reason, we place the scar at the caudal border of the pectoralis muscle. This landmark is not necessarily at the level of the existing inframammary crease in large breasts. If necessary, the caudal mark for the elliptical incision is moved up on the breast so that the resulting scar rests cephalad to the IMF. Fascia is disrupted as needed to blur the IMF crease. Because of the difficulties in draping redundant

skin, the chance of producing a “dog ear” of redundant tissue is higher in patients with a MFNG technique. Lateral dog ears are excised at the initial procedure when obvious. Medial dog ears often necessitate connecting the 2 incisions of the “double incision” procedure across the midline. Despite these efforts, the incidence of revision was 10% in MFNG patients, 75% of which were dog ears excisions, similar to the other published results.^{6,7}

Areola size and location also affect outcome. Between the NSM group and the MFNG group, 89% of patients required resizing of the areola. Multiple studies have found that the “ideal” male areola is approximately 25 mm.^{9,10} In the NSM/periareolar mastopexy group, a new dimension of 25 mm was used. In the MFNG group, there appears to be some stretching of the areola, possibly due to tension on the skin closure or slight hypertrophy of the periarolar scar. After this phenomenon was noticed, a dimension of 22 mm was used for free nipple graft dimensions to allow for slight expansion during wound healing. Nipple location was not altered in the NSM group, even in the instance where a periareolar mastopexy was performed. For patients having MFNG, the new areola site was placed in accordance with previously published guidelines^{9,10} in the fourth to fifth interspace and approximately 11 cm from the sternal midline. Our own findings indicate that the areola is often 1.5 cm above our chosen infrapectoral scar. Because it is difficult to site the areola preoperatively with a large breast and the fact that intraoperatively tension is placed on the skin which may alter the position of previously placed marks in an unpredictable way, a grid is marked on the patient's chest (Fig. 5). Vertical lines are at 5 and

TABLE 3. Satisfaction Scores by Procedure

		Completed	Response Rate	Satisfaction Score Average
NSM	Only	4	40.0%	4.75
	NR	4	80.0%	4.75
	AR	6	60.0%	4.67
	AR + NR	11	73.3%	4.82
MFNG	Only	31	66.0%	4.77
	NR	1	100.0%	5.00
			66.7%	4.78
All	Σ	57	64.8%	4.77

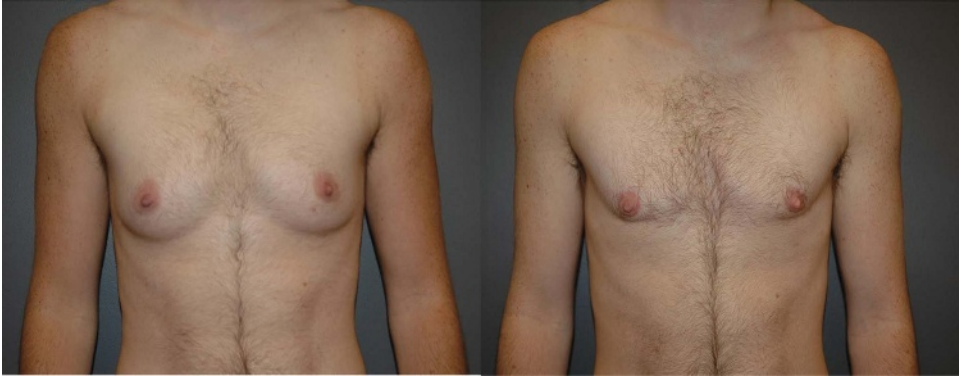


FIGURE 2. (Left) A 24-year-old patient on testosterone for 2 years. The patient has small breasts and good skin elasticity with an areola diameter of 35 mm on stretch. (Right) The 6-month postoperative view after bilateral nipple sparing mastectomies and a periareolar mastopexy. The new areola diameter is 22 mm.



FIGURE 3. (Left) Preoperative view of a 25-year-old patient with glandular ptosis and moderate skin laxity. The patient is not on testosterone. (Right) One-year postoperative view after bilateral mastectomies, free nipple grafts and nipple reduction. The patient underwent revision of a hypertrophic scar on the medial left infrapectoral incision line at 6 months.

10 cm from midsternum and horizontal lines are placed at 10, 12, and 14 cm from the clavicle. The lateral border of the pectoralis is also marked. After closure of the infrapectoral incision, the patient is placed into a sitting position, and the new areola sites are confirmed and marked. The previously marked grid allows for improved orientation and symmetrical outcomes.

The final component of NAC construction is adjustment of nipple size. Most MFNG patients will lose enough nipple projection through defatting of the areola that actual external reduction of the nipple will not be necessary. Early in our series, nipples were more aggressively reduced in MFNG patients with the result that nipple projection was lost altogether. In the NSM group, overprojecting nipples will not shrink without active intervention. In such patients, a 4-flap nipple reduction at the time of NSM with or without periareolar mastopexy is offered. No nipples were lost regardless of technique, but 12.5% (1 of 8) of the revisions and 50% of the patients (2 of 4) with a complaint about their surgery were related to an oversized nipple.

Complications with transgender mastectomy are rare. Similar to other studies, hematoma was the most common short-term complication and occurred more often in patients undergoing an NSM.^{6,11} This is likely due to decreased visualization while obtaining hemostasis during the operation given the small periareolar incision. Although testosterone use did correlate with hematoma formation, it is unclear whether this caused their increased incidence, because hormone treatments are known to be prothrombotic. Other studies have not shown any correlation between testosterone use and hematoma formation or thrombotic

complications.¹¹ There were no episodes of nipple necrosis, even in the hematoma group.

The most common long-term complication is a hypertrophic scar, which only occurred in the patients with MFNG technique. All late revisions were related to revision of hypertrophic scars or dog ear



FIGURE 4. Nonideal candidate for a short incision technique. Such patients often present believing that they are candidates for a nipple sparing mastectomy because they have small breasts. Such patients require counseling regarding the inability of their skin to contract sufficiently and the possibility of significant contour irregularities.



FIGURE 5. Preoperative marking for mastectomies and free nipple grafts showing the orientation grid and proposed new sites for the NAC. Note that the caudal incision line is drawn above the inframammary crease so that the final scar will lie near the pectoral insertion.

excision. Incisions directly on the chest as opposed to the breast are known to have higher rates of hypertrophic scarring and these can be treated with re-excision, silicone sheeting, steroid injection or laser treatment as is appropriate.¹² All late revisions were related to revision of hypertrophic scars or dog ear excision. The incidence of revision was 10% in MFNG patients, 75% of which were dog ear excisions, similar to other published results.^{6,7} Such revisions are minor, require only local anesthesia, do not require a prolonged recovery, and do not impact patient satisfaction.

There is no validated method of assessing transgender surgery outcomes, because this population presents problems for follow-up. These surgeries are relatively uncommon, the patients often travel long distances for their operation, patients often move and change identity, and transgender patients are particularly concerned with maintaining confidentiality.^{3,11} Despite these challenges, several studies have tried to categorize outcomes by an analog scale and have had similar results to ours showing that most people are very satisfied with their outcome.¹¹ However, these metrics are not sufficient and do not examine how the patient is integrating into their new life. Transgender and nontransgender cosmetic patients have similar preoperative feelings toward their bodies, similar cosmetic and psychological motivations for surgery, and similar benefits of surgery.¹³ In our patient population,

84.2% felt comfortable taking their shirt off in front of others, and 100% would recommend the surgery to other transgender individuals. Although we are pleased with these outcomes, we recognize that a more in depth and validated procedure-specific survey, such as the Breast-Q, would be more optimal to measure patient-reported outcomes.¹⁴

CONCLUSIONS

Awareness of transgender individuals has led to increased acceptance and demand for surgical services. Female to male transgender mastectomy can be performed with low complication rates with high patient satisfaction.

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